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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the display front plate using the near infrared absorptivity constituent and this constituent which have an absorption feature to the light of a near infrared region.

[0002]

[Description of the Prior Art]What contains the phosphoric ester compound currently indicated by JP,6-118228,A and the ionicity metallic component which uses a copper ion as the main ingredients as a material which has the conventional near infrared absorption feature is mentioned.

[0003]

[Problem(s) to be Solved by the Invention]However, it was not able to be said that the constituent containing this conventional material component not necessarily had an enough absorptivity of a near infrared. Then, an object of this invention is to provide the near infrared absorptivity constituent which can be improved in near infrared absorption performance in view of such a technical problem. An object of this invention is to provide the display front plate which can be improved in near infrared absorption performance by using such a near infrared absorptivity constituent.

[0004]

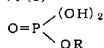
[Means for Solving the Problem]A place which repeated research wholeheartedly on many sides about the spectroscopy characteristic of a phosphoric ester [this inventions] compound, and its copper compound in order to attain the above-mentioned purpose, By an ingredient ratio of a monoester phosphate compound ingredient and a diester phosphate compound ingredient, it found out that the spectroscopy characteristic changed and this invention was reached.

[0005]Namely, a near infrared absorptivity constituent of this invention, At least one ingredient is contained among the following (A) ingredient and the following (B) ingredient. a rate of a monoester phosphate compound ingredient and a diester phosphate compound ingredient -- a mole ratio -- 63:37-99:1 -- it is preferably characterized by 63:37-85:15, and being 63:37-80:20 still more preferably.

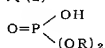
Ingredient : (A) A copper ion, An ingredient (B) ingredient which comprises a diester-phosphate compound expressed with a monoester-phosphate compound and a following formula (2) which are expressed with a following formula (1): An ingredient which comprises a diester phosphate copper compound expressed with a monoester phosphate copper compound and a following formula (4) which are expressed with a following formula (3) [0006]

[Formula 2]

式 (1)



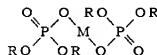
式 (2)



式 (3)



式 (4)

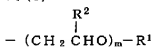


[但し、Rは、それぞれ独立して下記式 (5) 又は下記式 (6) で表される基を示し、Mは銅イオンを示す。

式 (5)



式 (6)



(但し、R¹ は、炭素数が1〜20のアルキル基を示し、
R² は、水素原子又は炭素数が1〜4のアルキル基を示し、
mは1〜6の整数である。)]

[0007]According to the near infrared absorptivity constituent of such this invention, a phosphate group of a phosphoric ester compound combines with a copper ion by coordinate bond and/or an ionic bond, and after having been surrounded by phosphoric ester, this copper ion, Into a constituent, it dissolves or distributes and selective absorption of the near infrared is carried out by electron transition between d orbits of this copper ion. And wavelength of a near infrared with which an absorptivity becomes it high most that rates of a monoester phosphate compound ingredient and a diester phosphate compound ingredient are 63:37-99:1 in a mole ratio (transmissivity becomes small most) is set to abbreviated 840nm, and. Transmissivity in wavelength of 1000 nm is less than 20%, and near infrared absorption performance is improved.

[0008]A phosphoric ester compound of the above-mentioned (A) ingredient and a phosphoric ester copper compound of the above-mentioned (B) ingredient, Since it does not have an unsaturated double bond in molecular structure but is hard to harden with ultraviolet rays or heat, Even if it is made to polymerize and does not make it stabilize with resin, a thin film of near infrared absorptivity can be formed by applying to a flat surface a thing which made a solvent dissolve or distribute the above-mentioned (A) ingredient or the above-mentioned (B) ingredient, i.e., a liquid object, and, for example, drying it. A phosphoric ester compound of the above-mentioned (A) ingredient and a phosphoric ester copper compound of the above-mentioned (B) ingredient have a good mold-release characteristic at the time of not having an unsaturated double bond in molecular structure, but mixing with resin, and making it polymerize in a mold. Since mold goods have thermoplasticity, they become easy [remolding by heat]. Even if thermoforming is performed, there is almost no degradation of the spectral characteristic.

[0009]This invention persons found out a near infrared absorptivity constituent excellent in the heat-resistant performance also in a phosphoric ester compound in the above-mentioned (A) ingredient and the above-mentioned (B) ingredient, and a phosphoric ester copper compound. Namely, a monoester phosphate compound expressed with said formula (1), a diester phosphate compound expressed with said formula (2), A diester phosphate copper compound expressed with a monoester phosphate copper compound expressed with said formula (3) and said formula (4) is preferred if m in said formula (5) or said formula (6) has the basis R which is 1. If it does in this way, copper salt and a phosphoric ester copper compound of a phosphoric ester compound in which m has the basis R which is 1, Since m has high pyrolysis temperature as compared with copper salt and a phosphoric ester copper compound of a phosphoric ester compound which have the basis R which are two or more integers, Molding temperature at the time of carrying out thermoforming of the constituent containing copper salt or a phosphoric ester copper compound of a phosphoric ester compound which has the basis R whose m is 1 can be raised, and it becomes possible to improve molding workability.

[0010]A near infrared absorptivity constituent of this invention is much more preferred, if at least one ingredient contains in resin which is a partial saponification thing of acrylic resin, polyvinyl-butylal system resin, an ethylene-vinylacetate copolymer, or this copolymer and changes among the above-mentioned (A) ingredient and the above-mentioned (B) ingredient. Since acrylic resin is excellent in a visible light transmittance state, molding processability, etc. if it does in this way, mold goods of near infrared absorptivity excellent in translucency, molding processability, etc. are obtained. A partial saponification thing of polyvinyl-butylal system resin, an ethylene-vinylacetate copolymer, or this copolymer, Since an adhesive property over a substrate which comprises a glass material or a plastic material is excellent, and itself has pliability and temperature dependence is still smaller, Even if it does not use

adhesives, adhesion to a substrate is trustworthy, mold goods which have the near infrared absorptivity which was therefore excellent in molding workability can be obtained simply, and mold goods which can improve tolerance over a temperature change are obtained.

[0011]further -- again -- a content ratio of the above-mentioned copper ion -- 0.1- of the whole constituent -- it is much more suitable 0.3 to 15% of the weight preferably 20% of the weight in it being 0.5 to 5 % of the weight more preferably. When it is in a tendency for performance which absorbs a near infrared at high efficiency as this rate is less than 0.1 % of the weight not to be obtained and another side and this rate exceed 20 % of the weight, it is in a tendency it to become difficult to distribute a copper ion in resin. Therefore, when a content ratio of a copper ion uses 0.1 to 20% of the weight of the whole constituent, a constituent of near infrared absorptivity excellent in near infrared absorptivity and a visible light transmittance state can be obtained certainly.

[0012]Transmissivity of a near infrared in wavelength of 1000 nm is still more preferred preferably in it being 10% or less still more preferably 15% or less 20% or less. Since light of a near infrared region called a heat ray will fully decline if it does in this way, a shielding effect of a heat ray can be improved.

[0013]A display front plate of this invention is provided with a near infrared absorption layer containing a near infrared absorptivity constituent of above-mentioned this invention. Since a near infrared absorptivity constituent which can be improved in near infrared absorption performance like **** is used according to such a display front plate, it becomes possible to provide a display front plate which can be improved in near infrared absorption performance.

[0014]The above-mentioned display is preferred in it being a plasma display panel. A plasma display panel conflicts in an electronic display, and its generating intensity of a reason near infrared is high, Although a possibility that apparatus, such as infrared remote control put around a plasma display panel, will malfunction is high, such malfunction is effectively prevented by applying a display front plate of this invention to a plasma display panel. A plasma display panel is a device promising as a large sized display with a screen of a large area, and enlargement is required also for a display front plate according to such a large-sized screen. A display front plate of this invention is excellent in molding workability when forming a near infrared absorption layer as a resin composition, Since a near infrared absorption layer can be formed also by applying a liquefied constituent containing the above-mentioned (A) ingredient and/or the above-mentioned (B) ingredient to a transparent substrate etc., a display front plate corresponding to display shape more large-sized than before is obtained simply.

[0015]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described in detail.

[0016]<(A) Ingredient> The (A) ingredient comprises the phosphoric ester compound (henceforth "a specific phosphoric ester compound") expressed with a copper ion and the

above-mentioned formula (1). As an example of the copper salt for supplying a copper ion, Although the anhydrides and hydrates of copper salt of inorganic acid, such as the copper salt anhydride of organic acid, such as copper acetate, formic acid copper, copper stearate, copper benzoate, ethylaceto copper acetate, copper pyrophosphate, copper naphthenate, and cupric citrate, a hydrate or copper hydroxide, a copper chloride, copper sulfate, a cupric nitrate, and basic copper carbonate, are mentioned, It is copper acetate and copper benzoate to use organic acid salt desirable especially preferably. for the above-mentioned (A) ingredient, metal ions (the following -- "-- others -- it is called metal ion".) other than a copper ion may contain. As an example of other metal ions to apply, the ion by metal, such as sodium, potassium, calcium, iron, manganese, magnesium, and nickel, is mentioned.

[0017]The above-mentioned specific phosphoric ester compound is manufactured by either the following method [1st], the 2nd method and the 3rd method, for example.

[0018][The 1st method] : This 1st method is a method to which the alcohol (henceforth "specific alcohol") expressed with a following formula (7) or a following formula (8) and diphosphorus pentaoxide are made to react in a non-solvent or a proper organic solvent.

[0019]

[Formula 3]

式 (7)

式 (8)



〔但し、 R^1 は、炭素数が1～20のアルキル基を示し、

R^2 は、水素原子又は炭素数が1～4のアルキル基を示し、

m は1～6の整数である。〕

[0020]As an organic solvent used for the reaction of specific alcohol and diphosphorus pentaoxide here, Are an organic solvent which does not react to diphosphorus pentaoxide, and For example, hexane, cyclohexane, Hydrocarbon system solvents, such as heptane, octane, benzene, toluene, xylene, and petroleum spirit, Halogenated hydrocarbon solvents, such as chloroform, a carbon tetrachloride, a dichloroethane, and chlorobenzene, Ketones, such as ethers solvents, such as diethylether, diisopropyl ether, dibutyl ether, and a tetrahydrofuran, acetone, methyl ethyl ketone, and dibutyl ketone, etc. are mentioned, and toluene and xylene are preferred in these. 0-100 ** of reaction temperature is 40-80 ** preferably, and the reaction time of the reaction condition of specific alcohol and diphosphorus pentaoxide is 4 to 9 hours preferably for 1 to 24 hours.

[0021]By using specific alcohol and diphosphorus pentaoxide in this 1st method at a rate set to 3:1 by a mole ratio, for example, a rate of a monoester phosphate compound (only henceforth "monoester") whose number of hydroxyl groups expressed with said formula (1) is 2, and a

diester phosphate compound (only henceforth "diester") whose number of hydroxyl groups expressed with said formula (2) is 1 -- abbreviated -- a mixture of 1:1 is obtained. specific alcohol and diphosphorus pentoxide -- comparatively -- and a thing for which a reaction condition is chosen suitably -- a rate of monoester and diester -- a mole ratio -- 63:37-99:1 -- it is preferably adjusted within 63:37-85:15, and limits set to 63:37-80:20 still more preferably.

[0022][The 2nd method] : This 2nd method is the method of adding water to output which makes specific alcohol and oxy phosphorus halide react, and is acquired in a non-solvent or a proper organic solvent, and hydrolyzing into it. As oxy phosphorus halide, it is phosphorus oxychloride to use phosphorus oxychloride and a oxy phosphorus bromide desirable especially preferably. As an organic solvent used for a reaction of specific alcohol and oxy phosphorus halide, Are an organic solvent which does not react to oxy phosphorus halide, and For example, hexane, Cyclohexane, heptane, octane, benzene, toluene, xylene, Hydrocarbon system solvents, such as petroleum spirit, chloroform, a carbon tetrachloride, a dichloroethane, Ethers solvents, such as halogenated hydrocarbon solvents, such as chlorobenzene, diethylether, diisopropyl ether, and dibutyl ether, are mentioned, and toluene and xylene are preferred in these. And 0-110 °C of reaction temperature is 40-80 °C preferably, and reaction time of a reaction condition of specific alcohol and oxy phosphorus halide is 2 to 8 hours preferably for 1 to 20 hours. In this 2nd method, monoester can be obtained by using specific alcohol and oxy phosphorus halide at a rate set to 1:1 by a mole ratio, for example.

[0023]In using specific alcohol expressed with the above-mentioned formula (8), Choose a rate and a reaction condition of this specific alcohol and oxy phosphorus halide, and as a reaction catalyst, As Lewes acid catalysts, such as titanium tetrachloride (TiCl_4), a magnesium chloride (MgCl_2), and an aluminium chloride (AlCl_3), and a catch agent of chloride which carries out a byproduction, amines, such as triethylamine and tributylamine, pyridine, etc. are used preferably. A mixture of monoester and diester is obtained by using these reaction catalysts and a chloride catch agent. And comparatively as this specific alcohol and oxy phosphorus halide and a rate which it is with monoester and diester by choosing suitably conditions concerning a reaction including a reaction catalyst, a mole ratio -- 63:37-99:1 -- it is preferably adjusted within 63:37-85:15, and limits set to 63:37-80:20 still more preferably.

[0024]In using specific alcohol expressed with the above-mentioned formula (7), Choose a rate and a reaction condition of this specific alcohol and oxy phosphorus halide, and. a mixture of monoester and diester is obtained by using together the Lewes acid catalyst and a chloride catch agent -- this time -- that rate -- a mole ratio -- 63:37-99:1 -- it is preferably adjusted within 63:37-85:15, and limits set to 63:37-80:20 still more preferably. If an ingredient ratio of monoester becomes more than 63 mol %, an absorptivity of a near infrared near wavelength of 840 nm will become large as compared with other wavelength, and, moreover, transmissivity in wavelength of 1000 nm will be less than 20%. When an ingredient ratio of monoester is less

than 85 mol %, it becomes possible to act as Kougami of solubility to media, such as resin, or the dispersibility more.

[0025]However, in using what has a several meters small repeating unit of an alkylene oxide group as specific alcohol. Since a phosphoric ester compound obtained becomes a water-soluble thing, when chloride catch agents, such as amines, are used, it is to remove an amine hydrochloride generated by washing by water in a tendency which becomes difficult. Above, as amount of reaction catalyst used, 0.005-0.2 mol is 0.01-0.05 mol preferably to 1 mol of oxy phosphorus halide.

[0026][The 3rd method] : This 3rd method is the method of oxidizing a phosphonate compound which compounded a phosphonate compound and was obtained after that by making specific alcohol and 3 phosphorus halide react in a non-solvent or a proper organic solvent. As 3 phosphorus halide, it is a phosphorus trichloride to use a phosphorus trichloride and phosphorus tribromide desirable especially preferably. As an organic solvent used for a reaction of specific alcohol and 3 phosphorus halide, Are an organic solvent which does not react to 3 phosphorus halide, and For example, hexane, Cyclohexane, heptane, octane, benzene, toluene, xylene, Hydrocarbon system solvents, such as petroleum spirit, chloroform, a carbon tetrachloride, a dichloroethane, Ethers solvents, such as halogenated hydrocarbon solvents, such as chlorobenzene, diethylether, diisopropyl ether, and dibutyl ether, are mentioned, and hexane and heptane are preferred in these. And 0-90 ** of reaction temperature is 40-75 ** preferably, and reaction time of a reaction condition of specific alcohol and 3 phosphorus halide is 2 to 5 hours preferably for 1 to 10 hours.

[0027]As a means to oxidize the above-mentioned phosphonate compound, by making halogen, such as gaseous chlorine, react to a phosphonate compound, a phosphoro HARORI date compound can be compounded and a means to hydrolyze this phosphoro HARORI date compound can be used. Here, 0-40 ** is desirable especially preferred, and reaction temperature of a phosphonate compound and halogen is 5-25 **. Before oxidizing a phosphonate compound, this phosphonate compound may be distilled and refined.

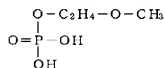
[0028]In this 3rd method, diester is obtained in high purity by using specific alcohol and 3 phosphorus halide at a rate set to 3:1 by a mole ratio, for example. As specific alcohol and 3 phosphorus halide, comparatively and by choosing a reaction condition, a mixture of monoester and diester is obtained -- this time -- that rate -- a mole ratio -- 63:37-99:1 -- it is preferably adjusted in 63:37-85:15, and the range set to 63:37-80:20 still more preferably. If an ingredient ratio of monoester becomes more than 63 mol % as mentioned above, an absorptivity of a near infrared near wavelength of 840 nm will become large as compared with other wavelength, and, moreover, transmissivity in wavelength of 1000 nm will be less than 20%. When especially an ingredient ratio of monoester is less than 85 mol %, it becomes possible to improve solubility to media, such as resin, or dispersibility more.

[0029]As a desirable example of a specific phosphoric ester compound manufactured by the above the 1st - 3rd method, etc., compounds expressed with following formula (9)-a - following formula (9)-x are enumerated. these compounds -- like **** -- a rate of monoester and diester - a mole ratio -- 63:37-99:1 -- it is preferably combined and used within 63:37-85:15, and limits set to 63:37-80:20 still more preferably.

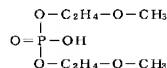
[0030]

[Formula 4]

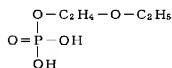
式 (9) - a



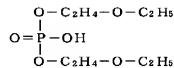
式 (9) - b



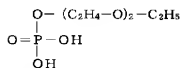
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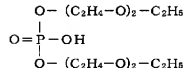
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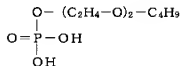
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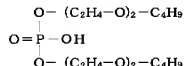
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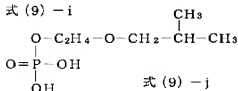
式 (9) - g



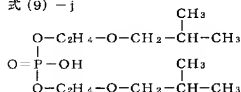
式 (9) - h



式 (9) - i



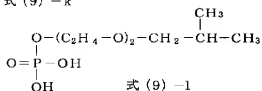
式 (9) - j



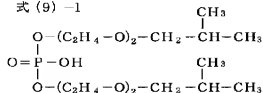
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[Formula 5]

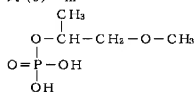
式 (9) - k



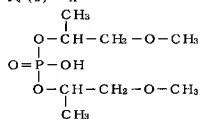
式 (9) - l



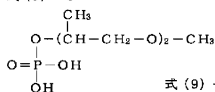
式 (9) - m



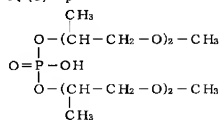
式 (9) - n



式 (9) - o



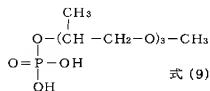
式 (9) - p



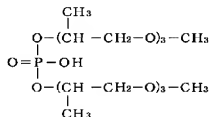
[0032]

[Formula 6]

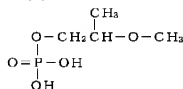
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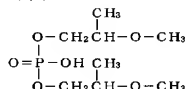
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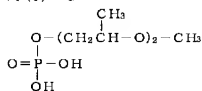
式 (9) - s



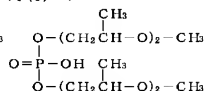
式 (9) - t



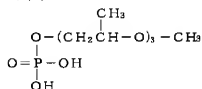
式 (9) - u



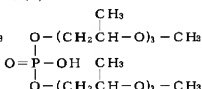
式 (9) - v



式 (9) - w



式 (9) - x



[0033]By the way, since an alkoxy group which has a certain amount of polarity exists in the molecular structure so that it may be expressed with the above-mentioned formula (1), a specific phosphoric ester compound which constitutes the (A) ingredient has good solubility or dispersibility over media, such as a solvent and resin. For example, it is acrylic resin and what has compatibility good dispersibility to acrylic ester system resin especially (meta) and high to these resin. As other resin with high compatibility with this specific phosphoric ester compound, Polyethylene terephthalate (PET), polyethylene, polypropylene, polyvinyl chloride and polycarbonate -- further -- styrene, alpha-methylstyrene, KURORU styrene, and a jib -- polymers, such as aromatic vinyl compounds, such as ROM styrene, methoxy styrene, and vinylbenzoic acid and hydroxymethylstyrene, are mentioned. Especially resin that is a partial saponification thing of polyvinyl-butylal system resin, an ethylene-vinylacetate copolymer, or this copolymer is also preferred. Hereafter, although explained taking the case of acrylic resin

among these resin after explanation of the (B) ingredient, acrylic resin may be read as resin other than above-mentioned acrylic resin. When it is necessary to indicate both acrylic acid or its derivative and methacrylic acid, or its derivative, a meaning of "meta" surrounded by above-mentioned () is a description method currently used for convenience in order to indicate briefly, and is adopted also in this specification.

[0034]<(B) Ingredient> The (B) ingredient comprises a phosphoric ester copper compound (henceforth "a specific phosphoric ester copper compound") expressed with the above-mentioned formula (3) or the above-mentioned formula (4). Such a specific phosphoric ester copper compound is obtained by making a specific phosphoric ester compound mentioned above and the above-mentioned copper salt react. A reaction of a specific phosphoric ester compound and copper salt is performed by contacting both under proper conditions. A method which mixes a phosphoric ester compound and copper salt of (b) specification and to which both are made to specifically react, (**). An organic solvent layer which a method and a phosphoric ester compound of (**) specification to which a specific phosphoric ester compound and copper salt are made to react contain in an organic solvent, and changes in a proper organic solvent, By contacting a water layer where it dissolves or distributes and copper salt changes, a method etc. to which a specific phosphoric ester compound and copper salt are made to react are mentioned. 0-150 °C of reaction temperature is 40-100 °C preferably, and reaction time of a reaction condition of this specific phosphoric ester compound and copper salt is 1 to 7 hours preferably for 0.5 to 10 hours.

[0035]As an organic solvent used in a method of the above-mentioned (**), If a specific phosphoric ester compound used may be dissolved, Especially, it is not limited but For example, aromatic compounds, such as benzene, toluene, and xylene, Alcohols, such as methyl alcohol, ethyl alcohol, and isopropyl alcohol, Glycol ether, such as methyl cellosolve and ethylcellosolve, diethylether, Ester species, such as ketone, such as ether, such as diisopropyl ether and dibutyl ether, acetone, and methyl ethyl ketone, and ethyl acetate, hexane, kerosene, petroleum ether, etc. are mentioned. An organic solvent which has polymerization nature, such as aromatic vinyl compounds, such as acrylic ester (meta), such as acrylate (meta), styrene, and alpha-methylstyrene, is also used.

[0036]On the other hand as an organic solvent used in a method of the above-mentioned (**), If a specific phosphoric ester compound which is insoluble or refractory and is used for water may be dissolved or distributed, Aromatic compounds, ether, ester species, hexane, kerosene, acrylic ester (meta), an aromatic vinyl compound, etc. are mentioned among what was illustrated as an organic solvent which is not limited, for example, is especially used in a method of (**).

[0037]In a reaction of a specific phosphoric ester compound and copper salt, an acid component which is negative ion is separated from copper salt. Since such an acid component

can become the cause of reducing moisture resistance and thermal stability of a resin composition, removing if needed is preferred. When manufacturing a phosphoric ester copper compound by a method of the above-mentioned (***) or (***), after making a specific phosphoric ester compound and copper salt react, a generated acid component (an acid component and an organic solvent which were generated in a method of (**)) is removable by distillation. In manufacturing a phosphoric ester copper compound by a method of the above-mentioned (**), In an organic solvent layer which a specific phosphoric ester compound contains to an organic solvent insoluble to water, or refractory as a desirable method of removing an acid component, and grows into it. After neutralizing by adding alkali, a phosphoric ester compound and copper salt more specific than contacting this organic solvent layer and a water layer where copper salt was dissolved or distributed are made to react, and there is a method of separating an organic solvent layer and a water layer after that. Here, although sodium hydroxide, a potassium hydrate, ammonia, etc. are mentioned as alkali, it is not limited to these. Since according to this method a water-soluble salt is formed, and this salt shifts to a water layer with an acid component and alkali which are separated from copper salt and a specific phosphoric ester copper compound generated shifts to an organic solvent layer, an acid component is removed by separating this water layer and an organic solvent layer.

[0038] In a phosphoric ester copper compound expressed with a phosphoric ester compound, the above-mentioned formula (3), and the above-mentioned formula (4) which are expressed with the above-mentioned formula (1) and the above-mentioned formula (2) here, the basis R is an alkyl group with which an alkylene oxide group was combined, as expressed with the above-mentioned formula (5) or the above-mentioned formula (6). a several meters repeating unit of an alkylene oxide group in the above-mentioned specific phosphoric ester compound and the above-mentioned specific phosphoric ester copper compound -- 1-6 -- it is an integer of 1-3 preferably. If a value of this m exceeds 6, hardness when it is considered as a resin composition will fall substantially. On the other hand, performance which a value of m makes distribute a copper ion in resin when 0, i.e., an alkylene oxide group, is not combined falls remarkably.

[0039] It is especially suitable in a several meters repeating unit of a viewpoint of the thermal stability of a phosphoric ester compound and a phosphoric ester copper compound and a resistance to environment to this alkylene oxide group being 1. Copper salt and a phosphoric ester copper compound of a phosphoric ester compound in which this m has an alkylene oxide group which is 1, Since m has high pyrolysis temperature as compared with them which have an alkylene oxide group which are two or more integers, When m carries out thermoforming of the constituent containing copper salt and a phosphoric ester copper compound of a phosphoric ester compound which have an alkylene oxide group which is 1, the molding temperature can be raised. Therefore, shaping becomes easy and it becomes possible to

improve molding workability more. Copper salt and a phosphoric ester copper compound of a phosphoric ester compound which have an alkylene oxide group whose m is 1 have the outstanding resistance to environment as compared with them which have an alkylene oxide group whose m is two or more integers. Copper salt and a phosphoric ester copper compound of a phosphoric ester compound in which m specifically has an alkylene oxide group which is 1, They which have an alkylene oxide group whose m is two or more integers are in a tendency for temporal degradation to take place, to what does not almost have temporal degradation of light transmission of a visible region under a high-humidity/temperature environment.

[0040]As mentioned above, although monoester whose number of hydroxyl groups expressed with the above-mentioned formula (1) is 2, and diester whose number of hydroxyl groups expressed with the above-mentioned formula (2) is 1 are used, a specific phosphoric ester compound, Since triester which a hydroxyl group has not combined does not have a hydroxyl group in which a copper ion, a coordinate bond, and/or an ionic bond are possible, when it is considered, for example as a resin composition, it is hard to distribute a copper ion in resin.

[0041]furthermore -- in the above-mentioned formula (5) or the above-mentioned formula (6) -- R^1 -- a carbon number -- 1-20 -- desirable -- 1-10 -- it is an alkyl group of 1-3 still more preferably. Since compatibility with resin falls when a carbon number of this alkyl group R^1 exceeds 20, it is hard to distribute a metal ion which contains a copper ion in resin. A carbon number of R^2 is an alkyl group of 1-4. That is, as an alkylene oxide group, a propylene oxide group, a butylene oxide group, etc. are mentioned, and especially a propylene oxide group is preferred. When a carbon number of this alkyl group R^2 exceeds 4, it is difficult in resin to make it distribute at a high rate.

[0042]As for a rate of a phosphoric ester compound and a copper ion in the above-mentioned (A) ingredient and the above-mentioned (B) ingredient, it is preferred that a hydroxyl group [in / to 1 mol of copper ions / a phosphoric ester compound] or 0.5-10 mol of oxygen atoms of hydroxyl group origin are 1.5-5 mol especially. When this rate is less than 0.5 mol, it is to distribute a copper ion in resin, such as acrylic resin, in a tendency which becomes difficult. Since a rate of a hydroxyl group of not participating in a coordinate bond and/or an ionic bond with a copper ion becomes excessive when this rate exceeds 10 mol, a constituent of such a presentation rate has hygroscopicity in a tendency which becomes comparatively large. Therefore, it becomes possible by this rate being 0.5-10 mol to obtain a near infrared absorptivity constituent which comprises a resin composition which a copper ion is distributed good in resin, and is excellent in a near infrared absorption feature, and does not have hygroscopicity.

[0043]And in making resin contain at least one ingredient and using it as a resin composition

among the (A) ingredient and the (B) ingredient. It is preferred that a content ratio of a copper ion is 0.1 to 20% of the weight of the whole resin composition, and it is 0.5 to 5 % of the weight still more preferably 0.3 to 15% of the weight more preferably. It is in a tendency for performance which absorbs a near infrared at high efficiency not to be obtained when this rate is less than 0.1 % of the weight, and on the other hand, when this rate exceeds 20 % of the weight, it is in a tendency it to become difficult to distribute a copper ion in resin. Therefore, when a content ratio of a copper ion uses 0.1 to 20% of the weight of the whole resin composition, a near infrared absorptivity constituent excellent in a visible light transmittance state can be obtained certainly.

[0044]As for a using rate of the above-mentioned metal ion, it is preferred that it is 50 or less % of the weight in all the metal ions containing a copper ion, and it is 20 or less % of the weight still more preferably 30 or less % of the weight more preferably. When this rate exceeds 50 % of the weight, in order to influence joint coordination of a copper ion and a phosphoric ester compound by other metal ions, it is in a difficult tendency to obtain a near infrared absorptivity constituent whose near infrared absorptivity is sufficiently large.

[0045]<Acrylic resin> As acrylic resin, a polymer obtained from an acrylic ester (meta) system monomer is preferably used like ****. As an example of this (meta) acrylic ester system monomer, Methyl (meta) acrylate, ethyl (meta) acrylate, n-propyl (meta) acrylate, n-butyl (meta) acrylate, isobutyl (meta) acrylate, Tertiary-butyl (meta) acrylate, n-hexyl (meta) acrylate, Alkyl (meta) acrylate, such as n-octyl (meta) acrylate. Glycidyl (meta) acrylate, 2-hydronalium SHIKIECHIRU (meta) acrylate, 2-HIDOROSHIKI propyl (meta) acrylate, hydroxybutyl (meta) acrylate, Isobornyl (meta) acrylate, methoxy polyethylene (meta) acrylate, Denaturation (meta) acrylate, such as phenoxy (meta) acrylate. Ethylene glycol di(metha)acrylate, diethylene GURIKORUJI (meta) acrylate, Poly ethylene glycol di(metha)acrylate, poly propyleneglycol di (meth) acrylate, 1, 3-butyleneglycol di(metha)acrylate, 1, 4-butanediol di(metha)acrylate, 1,6-hexanediol di(metha)acrylate, Neopentyl glycol di(metha)acrylate, 2-hydroxy-1,3-di(meth) acrylate, a 2,2-screw [4-(meta) acryloxy ethoxyphenyl] Propane, 2-hydroxy-1-(meta) acryloxy 3-(meta) acryloxy propane, Polyfunctional (meta) acrylate, such as TORIMECHI roll pro pantry (meta) acrylate, pen TAERI Tritt Tori (meta) acrylate, and pentaerythritol tetra (meta) acrylate, is mentioned. These monomers are independent, or are combined two or more kinds and may be used.

[0046]As another acrylic resin, a copolymer of the above-mentioned acrylic ester (meta) system monomer and other copolymeric monomers in which copolymerization with this (meta) acrylic ester system monomer is possible is also used. As an example of this copolymeric monomer, acrylic acid (meta), 2-(meta) acryloyloxyethyl succinic acid, Unsaturated carboxylic acid, such as 2-(meta) acryloyloxyethyl phthalic acid, acrylamide, such as N,N-dimethylacrylamide, styrene, alpha-methylstyrene, KURORU styrene, and a jib -- aromatic

vinyl compounds, such as ROM styrene, methoxy styrene, and vinylbenzoic acid and hydroxymethylstyrene, etc. are mentioned. These monomers are used combining independent or two sorts or more.

[0047]In using only a thing of monofunctional nature above as a monomer, It is obtained by thermoplastic resin and a part of monomer or in using all and using a polyfunctional thing, Since thermosetting resin is obtained, by choosing these resin compositions suitably, It is possible to obtain a near infrared absorptivity constituent according to the purpose of use, a use, a processing forming process, etc., if a thermoplastic thing is used as already stated, remolding after hardening will become easy and molding workability will improve.

[0048]<Liquefied constituent> a liquefied constituent used in this invention, As long as a thin film which dissolves or distributes at least one ingredient in a proper solvent among the aforementioned (A) ingredient and the aforementioned (B) ingredient, evaporates a solvent, and is generated is optically transparent, the liquefied constituent itself may be a transparent thing, a translucent thing, or an opaque thing. As a solvent, can use water or an organic solvent here and as an organic solvent, Alcohols, such as methyl alcohol, ethyl alcohol, isopropyl alcohol, and butyl alcohol, Glycol ether, such as methyl Cellosolve and ethyl Cellosolve, diethylether, Ether, such as diisopropyl ether, acetone, methyl ethyl ketone, Aromatic compounds, such as ester species, such as ketone, such as methyl isobutyl ketone and cyclohexanone, ethyl acetate, isopropyl acetate, butyl acetate, and butyl acetate Cellosolve, benzene, toluene, and xylene, hexane, kerosene, petroleum ether, etc. are used. An organic solvent which has polymerization nature, such as aromatic vinyl compounds, such as acrylic ester (meta), such as acrylate (meta), styrene, and alpha-methylstyrene, may also be used. And after applying such a liquefied constituent to a substrate face, for example, a thin film which has the outstanding near infrared absorption feature can be simply obtained by evaporating only a solvent.

[0049]Although a content ratio of the above-mentioned (A) ingredient in a liquefied constituent used by this invention and/or the above-mentioned (B) ingredient changes with a kind of solvent used, and uses or the purposes of using a near infrared absorptivity constituent which are gained, From a viewpoint of viscosity after preparation, it is usually preferably adjusted one to 900 mass part 0.1 to 1900 mass part to fluid-medium 100 mass part in the range which serves as five to 400 mass part preferably especially.

[0050]<Monomer composition> An acrylic ester system monomer described in explanation of the above <acrylic resin> as a monomer which constitutes a monomer composition used for this invention, or other copolymeric monomers which were described in explanation of the above <acrylic resin> are preferred.

[0051]<Acrylic resin composition> Although an acrylic resin composition is explained here as an example of a resin composition which contains at least one ingredient among the above-

mentioned (A) ingredient and the (B) ingredient, the same may be said of resin compositions other than an acrylic resin composition. Although this acrylic resin composition is prepared by making at least one ingredient contain in the above-mentioned acrylic resin among the above-mentioned (A) ingredient and the above-mentioned (B) ingredient and that concrete method in particular is not limited, the following two methods are mentioned as a suitable method.

[0052]Although a content ratio of the above-mentioned (A) ingredient in an acrylic resin composition used by this invention and/or the above-mentioned (B) ingredient changes with uses or the purposes of using a near infrared absorptivity constituent which are gained, From a viewpoint of a moldability (or moldability), it is usually preferably adjusted 0.3 to 200 mass part 0.1 to 400 mass part to resin 100 mass part in the range which serves as one to 100 mass part preferably especially. As mentioned above, in order to obtain certainly a resin composition excellent in a visible light transmittance state, it is desirable for a rate of a copper ion in a resin composition to be 0.1 to 20% of the weight of the acrylic whole resin composition, for example.

[0053][The 1st method]: This 1st method is the (A) ingredient (here) in a monomer for obtaining acrylic resin. It is the method of preparing a monomer composition which at least one ingredient contains among a thing which mixed a phosphoric ester compound and a copper salt compound, and the (B) ingredient, and changes, and carrying out radical polymerization treatment of this monomer composition. In this method, especially as the concrete method of radical polymerization treatment of a monomer composition, it is not limited and publicly known methods, such as a radical polymerization method using the usual radical polymerization initiator, for example, the massive (cast) polymerizing method, a suspension polymerization method, an emulsion polymerization method, and a solution polymerization method, can be used.

[0054][The 2nd method]: This 2nd method is the method of adding at least one ingredient among the (A) ingredient and the (B) ingredient, and mixing in acrylic resin. This method is used when using thermoplastics as acrylic resin. ** melting specifically How to add and knead at least one ingredient among the (A) ingredient and the (B) ingredient in acrylic resin carried out, ** Acrylic resin is dissolved, distributed or swollen to a proper organic solvent, and after adding at least one ingredient among the (A) ingredient and the (B) ingredient in this solution and mixing in it, there is a method of removing an organic solvent from this solution.

[0055]In a method of the above-mentioned **, as a means to knead at least one ingredient among acrylic resin, the (A) ingredient, and the (B) ingredient, After carrying out preliminary mixing with a means generally used as a melt kneading method of thermoplastics, for example, a means which carries out melt kneading with a roll mill, a Henschel mixer, etc., a means which carries out melt kneading with an extrusion machine is mentioned. On the other hand as an organic solvent used by a method of the above-mentioned **, If it can dissolve,

distribute or swell, not as a thing limited especially but as the example, the above-mentioned acrylic resin, Alcohols, such as methyl alcohol, ethyl alcohol, and isopropyl alcohol, Amide compounds, such as chlorine-based hydrocarbon, such as aromatic hydrocarbon, such as ketone, such as acetone and methyl ethyl ketone, benzene, toluene, and xylene, and a methylene chloride, dimethylacrylamide, and dimethylformamide, etc. are mentioned.

[0056]In preparation of the above acrylic resin composition, in using the (A) ingredient, as a result of a specific phosphoric ester compound's and copper salt's reacting, an acid component which is negative ion is separated from copper salt. As for such an acid component, it is preferred to remove for the same reason as the above-mentioned if needed. Before performing polymerization of a method of extracting an acid component by making a proper organic solvent immersing the (a) acrylic resin composition as a method for that, and the (b) monomer composition, a method of depositing an acid component and dissociating is illustrated by carrying out the cooling process of this monomer composition.

[0057]As an organic solvent used in a method of the above (a), An acid component separated can be dissolved, and if it has moderate compatibility (compatibility of a grade which permeates into this acrylic resin although acrylic resin is not dissolved) to acrylic resin used, it will not be limited in particular. As an example of such a solvent, methyl alcohol, ethyl alcohol, Lower aliphatic alcohol, such as n-propyl alcohol and isopropyl alcohol, Ketone, such as acetone, methyl ethyl ketone, and methyl isobutyl ketone. Aromatic system hydrocarbon, such as aliphatic series system hydrocarbon, such as ether, such as diethylether and petroleum ether, n-pentane, n-hexane, n-heptane, chloroform, methylene chloride, and a carbon tetrachloride, and a halogenide of those, benzene, toluene, and xylene, is mentioned. On the other hand, in a method of the above (b), it is preferred to use what an acid component separated cannot dissolve in a monomer easily as copper salt which constitutes the (A) ingredient, and, specifically, copper salt of carboxylic acid which has aromatic rings, such as benzoic acid, is mentioned.

[0058]<Partial saponification thing of polyvinyl-butyral system resin, an ethylene-vinylacetate copolymer, and this copolymer> Polyvinyl-butyral system resin, A partial saponification thing of an ethylene-vinylacetate copolymer or this copolymer, Since an adhesive property over a substrate which comprises a glass material or a plastic material is excellent, and itself has pliability and temperature dependence is still smaller, Even if it does not use adhesives, adhesion to a substrate is trustworthy, mold goods which have the near infrared absorptivity which was therefore excellent in molding workability can be obtained simply, and mold goods which can improve tolerance over a temperature change are obtained.

[0059]To a near infrared absorptivity constituent which comprises a resin composition containing these resin, including above-mentioned acrylic resin. Various plasticizers which have a resinous principle and compatibility as other ingredients can be made to contain, and,

thereby, dispersibility to inside of a resinous principle of a copper ion used as a near infrared absorption ingredient can be improved. As an example of such a plasticizer, phosphoric ester system plasticizers, such as tricresyl phosphate and triphenyl phosphate, Phthalate system plasticizers, such as dioctyl phthalate and dibutyl phthalate, Dibutyl sebacate, butyl tricinolate, methylacetyl tricinolate, Glycol system plasticizers, such as fatty acid system plasticizers, such as butyl succinate, butyl phthalyl butyl glycolate, a triethylene glycol JIBUCHI rate, triethylene glycol di-2-ethylbutyrate, and a polyethylene glycol, etc. are mentioned. A near infrared absorptivity constituent of this invention can also be made to contain an ultraviolet ray absorbent of a benzotriazol system, a benzophenone series, or a salicylic acid system, other anti-oxidants, stabilizer, etc.

[0060]<Display front plate> Drawing 7 is a figure showing one suitable embodiment concerning a display front plate of this invention, drawing 7 (a) is a sectional view, and drawing 7 (b) is a perspective view showing a laminated structure. The display front plate 1 shown in drawing 7 A plasma display panel. (it is hereafter called PDP.) -- it being an optically transparent plate attached to a front face, and, To one [which has a near infrared absorption layer which accomplishes approximately plate-like and comprises a near infrared absorptivity constituent of this invention] field of the transparent member 11. It is stuck and the shield mesh 13 which a small-gage wire which has conductivity is knit in all directions, and constitutes mesh state changes so that it may be covered by the product 14 made of resin, for example, a bright film made from polyethylene terephthalate (PET). The reflective reduction film 12 is formed throughout a field of another side of the transparent member 11. The antireflection film 15 as an antireflection layer is formed in a field of the bright film 14 which is not in contact with the shield mesh 13.

[0061]As the transparent member 11 adopted by this embodiment, the following three kinds of gestalten are preferred.

[The 1st gestalt]: That by which this near infrared absorptivity constituent was pasted together by transparent substrate which comprises a thing formed with a near infrared absorptivity constituent which comprises a resin composition which contains at least one ingredient among the above-mentioned (A) ingredient and the above-mentioned (B) ingredient, glass, or a transparent resin board.

[The 2nd gestalt]: That in which the near infrared absorptivity film 16 as a near infrared absorption layer which comprises a near infrared absorptivity constituent which contains at least one ingredient in a transparent substrate which comprises glass or a transparent resin board among the above-mentioned (A) ingredient and the above-mentioned (B) ingredient was formed.

[The 3rd gestalt]: That by which this near infrared absorptivity constituent was pasted together by transparent substrate which comprises a thing formed with a near infrared absorptivity

constituent only containing the above-mentioned (A) ingredient and/or the above-mentioned (B) ingredient, glass, or a transparent resin board.

[0062]an account of the upper -- a copper ion contained in a copper compound in every gestalt, if the (A) ingredient and/or the (B) ingredient are used, Since the above-mentioned compound does not have an energy level equivalent to wavelength of light (visible light) of a visible region while revealing the characteristic characteristic of a copper ion of absorbing a near infrared selectively, visible light is not absorbed. Therefore, according to the display front plate 1 of this invention containing these ingredients, as compared with the former, outstanding near infrared absorption performance and visible light transmission performance more than equivalent can be attained. and a rate of a monoester phosphate compound ingredient and a diester phosphate compound ingredient -- a mole ratio -- 63:37-99:1 -- desirable -- 63:37-85:15 -- since it is 63:37-80:20 still more preferably, near infrared absorption performance is improved much more.

[0063]The 1st gestalt of the above is manufactured by carrying out polymerization curing of the resin monomer which contains at least one ingredient among the (A) ingredient and the (B) ingredient, and considering it as a resin composition. At this time, a phosphoric ester compound in the (A) ingredient and/or the (B) ingredient, when carrying out polymerization curing of the above-mentioned resin monomer in a mold since it does not have an unsaturated double bond in molecular structure as shown in the above-mentioned formula (4) or the above-mentioned formula (5), as compared with the former, the mold-release characteristic of a resin composition after hardening is markedly alike, and is improved. Since this has the degree of cross linking of the above-mentioned resin composition lower than before, it may be presumed to be based on the degree of curing shrinkage being small as compared with a resin composition containing a phosphorus atom content compound which has the conventional double bond. Since a resin composition which contains at least one ingredient among the (A) ingredient and the (B) ingredient has thermoplasticity, remolding by heat after shaping is possible for it. therefore, according to the display front plate 1 provided with the transparent member 11 of the 1st gestalt of the above, it becomes possible to boil molding workability markedly and to improve as compared with the former.

[0064]Although what comprises acrylic resin, polycarbonate system resin, styrene resin, polyester resin, cellulose type resin, etc. is mentioned as resin which constitutes here a resin composition which contains at least one ingredient among the (A) ingredient and the (B) ingredient, Acrylic resin is especially suitable from viewpoints of a visible light transmittance state, weatherability, molding workability, etc. Thus, if it is considered as a resin composition which comprises acrylic resin, are easy to admire, without an image displayed on a display becoming dark, and it excels in endurance, and the display front plate 1 with few restrictions of working shape can be obtained.

[0065]On the other hand, for example, at least one ingredient of the (A) ingredient and the (B) ingredient applies to a substrates face a liquefied constituent dissolved or distributed by solvent, and the transparent member 11 of the 2nd gestalt of the above is generated by evaporating a solvent. Or the near infrared absorptivity film 16 can be formed on a substrates face also by spraying powder containing the (B) ingredient itself or the (B) ingredient, and making it adhere by a granular material spray etc. These granular materials may be made to adhere via slime, such as adhesives. Since the (A) ingredient and/or the (B) ingredient do not include a high unsaturated double bond of susceptibility over ultraviolet rays or heat in the molecular structure if it does in this way, the near infrared absorptivity film 16 formed in the 2nd gestalt of the above is stable to these ultraviolet rays or heat. Therefore, even if polymerization curing of at least one ingredient is carried out and it does not use it as a resin composition with resin among the (A) ingredient and the (B) ingredient, it excels in near infrared absorption performance, and the display front plate 1 which is thermally and chemically stable and does not deteriorate easily can be obtained. That is, it becomes possible to improve the selectivity of a method of manufacturing the display front plate 1, and material.

[0066]On the other hand, the transparent member 11 of the 3rd gestalt of the above is manufactured as film state or tabular mold goods by carrying out pressing of the ingredient which comprises only the (A) ingredient and/or the (B) ingredient, for example. When the transparent member 11 of this 3rd gestalt is used, it excels in a near infrared absorption feature, and it becomes possible to also lose some visible optical absorption by resin etc.

[0067]In the display front plate 1 provided with the transparent member 11 of each above-mentioned gestalt here, 20% or less, preferably, transmissivity of a near infrared as the display front plate 1 in a wavelength area with a wavelength of 800 nm - 1000 nm 15% or less so that it may become 10% or less still more preferably, A kind of the above-mentioned (A) ingredient and/or the above-mentioned (B) ingredient, concentration, and thickness (when applying or laminating and the layer thickness and a resin layer distribute, it is the thickness of a resin layer) are adjusted. Since a near infrared with a wavelength of about 950 nm mainly used, for example by infrared ray communication etc. will fully decline if it does in this way, there is no possibility of malfunctioning even when among the circumferences of a display are infrared remote control etc.

[0068]The shield mesh 13 is composed of a plastic fiber covered with transition metals, such as copper and nickel, for example, and has a function which covers effectively electromagnetic waves of a frequency range of the number Mhz - number 100Mhz. With a thin film which comprises low refractive index materials, such as a silica dioxide and an aluminum oxide, a thin film of high refractive index materials, such as a titanium dioxide and yttrium oxide, is laminated by turns, for example, and both the reflective reduction film 12 and the antireflection film 15 change.

[0069]Drawing 8 is a perspective view showing condition of use of the above-mentioned embodiment concerning a display front plate of this invention. As shown in drawing 8, the display front plate 1 which has a laminated structure shown in drawing 7 carries out a field in which the antireflection film 15 was formed ahead, and it is arranged so that the panel surface 21 of PDP2 may be covered. And a near infrared emitted from the panel surface 21 of PDP2 is absorbed by the transparent member 11 as a near infrared absorption layer, and intensity is preferably reduced to 10% or less still more preferably 15% or less 20% or less.

[0070]Since visible light emitted simultaneously with a near infrared from the panel surface 21 of PDP2 on the other hand is not absorbed by the above-mentioned (A) ingredient or the (B) ingredient which are contained in the display front plate 1 like ****, there is dramatically little visible absorption of light by the display front plate 1 as compared with a case of a near infrared. Therefore, even if apparatus which operates with a near infrared is placed around PDP2 shown in drawing 8, a near infrared emitted from the panel surface 21 of PDP2 can be effectively prevented from causing malfunction of these apparatus, and an image etc. which are projected on the panel surface 21 can be admired convenient.

[0071]Although electromagnetic waves are emitted from the panel surface 21 of PDP2, since such electromagnetic waves are effectively covered by the shield mesh 13 shown in drawing 7, they are not put to such electromagnetic waves during admiration of PDP2. Since this shield mesh 13 has about the same conductivity as metal, static electricity is hardly charged in the display front plate 1, but dust etc. are prevented from adhering to the display front plate 1 with static electricity. Since the shield mesh 13 is using a plastic fiber as the main ingredients, it can carry out the weight saving of the display front plate 1. And since the shield mesh 13 is rich in pliability, even when the display front plate 1 has uneven shape, there is an advantage which can be pasted together easily.

[0072]Outdoor daylight (mainly available light and light from an electric light) which enters into the panel surface 21 from the display front plate 1 side, Since reflecting by the multilayer operation from which a refractive index which forms the antireflection film 15 differs will be prevented if it enters into the antireflection film 15 of the display front plate 1, even if the circumference of PDP2 is bright, an image of the panel surface 21, etc. are prevented from becoming difficult to be by reflection of outdoor daylight in sight. Since reflection is reduced with the reflective reduction film 12 of the above-mentioned outdoor daylight in which this transmitted light was formed in a field of the transparent member 11 although a part penetrated the antireflection film 15 very much at this time, an image etc. which were reflected to the panel surface 21 by reflection of outdoor daylight are further prevented from becoming difficult to be in sight.

[0073]Here, a near infrared and infrared light are heat rays, and application to a member for which heat ray absorptivity is needed is also possible for a near infrared absorptivity

constituent of above-mentioned this invention. Below, a heat ray absorptivity coating agent, a heat ray absorptivity complex, a heat ray absorptivity binder, etc. are explained as such a member.

[0074]<Heat ray absorptivity coating agent> as a heat ray absorptivity coating agent, A thing which made a proper fluid medium dissolve or distribute a near infrared absorptivity constituent of this invention may be useful, and as long as a thin film which evaporates a liquefied solvent and is generated is optically transparent, the heat ray absorptivity coating agent itself may be a transparent thing, a translucent thing, or an opaque thing. As a fluid medium, can use water or an organic solvent here and as an organic solvent, Alcohols, such as methyl alcohol, ethyl alcohol, isopropyl alcohol, and butyl alcohol, Glycol ether, such as methyl Cellosolve and ethyl Cellosolve, diethylether, Ether, such as diisopropyl ether, acetone, methyl ethyl ketone, Aromatic compounds, such as ester species, such as ketone, such as methyl isobutyl ketone and cyclohexanone, ethyl acetate, isopropyl acetate, butyl acetate, and butyl acetate Cellosolve, benzene, toluene, and xylene, hexane, kerosene, petroleum ether, etc. are used. An organic solvent which has polymerization nature, such as aromatic vinyl compounds, such as acrylic ester (meta), such as acrylate (meta), styrene, and alpha-methylstyrene, is also used preferably.

[0075]A solubilizing agent for improving the surface smoothness etc. of a field coated by solubility or dispersibility, and a heat ray absorptivity coating agent to a fluid medium of the above-mentioned (A) ingredient or the above-mentioned (B) ingredient, etc. may be added as an additive agent. As such an additive agent, various kinds of surface-active agents as a leveling agent and a defoaming agent are used preferably, for example. As long as it is liquefied, resin which was described in explanation of the above-mentioned (A) ingredient may be added. Although a content ratio of the above-mentioned (A) ingredient in a heat ray absorptivity coating agent of this invention and/or the above-mentioned (B) ingredient changes with a kind of fluid medium used, a use of a heat ray absorptivity coating agent, or purposes of use, From a viewpoint of viscosity after preparation, it is usually preferably adjusted especially in the range used as five to 400 mass part one to 900 mass part 0.1 to 1900 mass part to fluid-medium 100 mass part.

[0076]<Heat ray absorptivity complex> That by which a near infrared absorption layer which comprises a near infrared absorption constituent was provided in one [which has translucency] field of a substrate as a heat ray absorptivity complex is useful, and another substrate which has translucency in one field of this near infrared absorption layer may be pasted together. As a material which constitutes a substrate, if it has a visible light transmittance state, it will not be limited in particular and will be suitably chosen according to a use of a heat ray absorptivity complex, but. Glass materials, such as viewpoints of hardness, heat resistance, chemical resistance, endurance, etc. to inorganic glass or organic glass, Or it

is suitable if plastic material, such as polycarbonate, an acrylonitrile styrene copolymer, polymethylmethacrylate, VCM/PVC system resin, polystyrene, and polyester, is used, for example. A substrate may comprise material which may comprise the respectively same kind of material, or is mutually different. When curing treatment of the field which is not in contact with a near infrared absorption layer of a substrate is carried out, it is desirable from damage prevention of the field, and a durable viewpoint. A layer which comprises translucency material of further others may be provided in a substrate.

[0077]What applied a heat ray absorptivity coating agent mentioned above to a field of one side of a plate which has film state, a sheet like material, or translucency which has translucency as a near infrared absorption layer, or both, and evaporated a fluid medium (solvent) is used preferably. Here, as a plate which has film state, a sheet like material, or translucency which has the translucency used, what comprises a glass material which forms the above-mentioned substrate, and a plastic material can be used.

[0078]It is suitable even if it uses a resin composition which contains at least one ingredient among the above-mentioned (A) ingredient and the (B) ingredient as a near infrared absorption layer. It is preferably used by what has the outstanding translucency as such a resinous principle, and specifically, VCM/PVC system resin, acrylic resin, polycarbonate system resin, polyester system resin, polyurethane system resin, polyvinyl-butylal system resin, an ethylene-vinyl acetate system copolymer, its partial saponification thing, etc. are mentioned. These resin is used combining independent or two sorts or more. Especially in these, a partial saponification thing of a polyvinyl butylal, an ethylene-vinylacetate copolymer, or this copolymer is preferably used from an adhesive viewpoint to a glass material or a plastic material. Acrylic resin is also preferably used from a visible light transmittance state, a molding processability viewpoint, etc.

[0079]A near infrared absorption layer which comprises a resin composition containing these resin may be made to contain above-mentioned various plasticizers which have a resinous principle and compatibility as other ingredients, an ultraviolet ray absorbent of a benzotriazol system, a benzophenone series, or a salicylic acid system, other anti-oxidants, stabilizer which were mentioned above, etc. In order to form on a substrate a near infrared absorption layer which comprises a resin composition and to obtain a heat ray absorptivity complex, following methods can be used, for example. However, a method of forming a near infrared absorption layer and obtaining a heat ray absorptivity complex is not limited to this. A near infrared absorption layer is formed by preparing a formation material of a near infrared absorption layer, and fabricating this material to film state or a sheet shaped by mixing the above-mentioned (A) ingredient and/or the above-mentioned (B) ingredient, the above-mentioned resinous principle, and an ingredient besides the above used if needed. And a near infrared absorption layer is pasted up on a substrate prepared beforehand.

[0080]As a means to prepare material for mixing each ingredient and forming a near infrared absorption layer, a means which carries out kneading mixing with a means, a roll kneading machine, or an extruding kneading machine mixed with mixers, such as a Henschel mixer, can be used. A proper organic solvent can be made to be able to distribute each ingredient, and a means to remove an organic solvent from these dispersion liquid can be used. As a means to manufacture a Plastic solid for near infrared absorption layers, a melting extrusion method, a calender molding method, a press-forming method, etc. which are fabricating-operation methods of thermoplastics can be used. A means made to paste by heating a near infrared absorption layer as a means pasted up on a substrate using a means, autoclave, etc. which are pasted up with application of pressure or decompression of the pressing method, the multi-rolling method, a manometric method, etc., or a means by such combination can be used. And as a resinous principle, when using a polyvinyl butyral, an ethylene-vinylacetate copolymer, or its partial saponification thing, a heat ray absorptivity complex which a near infrared absorption layer and a substrate pasted up by sufficient intensity is obtained.

[0081]Thus, as for especially a near infrared absorption layer formed, it is preferred that the thickness is 0.3-5 mm 0.1-10 mm. When thickness of a near infrared absorption layer is less than 0.1 mm, it is in a tendency used as what has the insufficient heat ray absorptivity of a heat ray absorptivity complex obtained by it being in a difficult tendency to obtain a near infrared absorption layer whose near infrared absorptivity is high enough. The visible light transmittance state of a heat ray absorptivity complex obtained by on the other hand it being in a difficult tendency to obtain a near infrared absorption layer with high transmissivity of visible light when thickness of a near infrared absorption layer exceeds 10 mm is in a tendency used as a low thing. It is suitable even if it has a near infrared absorption layer which comprises an acrylic resin composition mentioned above as a heat ray absorptivity complex. A reflective reduction layer or an antireflection layer may be provided in at least one field of a substrate of a heat ray absorptivity complex, and a near infrared absorption layer. as this reflective reduction layer or an antireflection layer, it was called vacuum deposition, ion plating, and sputtering using a publicly known material which comprises an inorganic oxide, inorganic halide, etc. -- many things can be made to form by a publicly known method An additive agent of a metal ion component containing a visible optical absorption agent which absorbs visible light of a specified wavelength, for example, cobalt ion which absorbs wavelength of 500 nm - 600 nm selectively, and others may be mixed in a resin composition if needed.

[0082]<Heat ray absorptivity binder> What contains at least one ingredient as a heat ray absorptivity binder among resin which has adhesiveness, the above-mentioned (A) ingredient, and the above-mentioned (B) ingredient is useful. As resin which has such adhesiveness, acrylic resin which has adhesiveness can be used preferably. Such acrylic resin that has adhesiveness is obtained by carrying out polymerization of the monomer composition

containing an acrylic resin monomer which constitutes an adhesive component. As an acrylic resin monomer used as this adhesive component, Carbon numbers of an alkyl group are 4-12, and a glass transition point of a homopolymer can use conveniently acrylic acid alkyl ester which is -70 °--30 °, and it specifically, n-butyl acrylate, 2-ethylhexyl acrylate, octyl acrylate, decyl acrylate, etc. are mentioned.

[0083]It is desirable to make a monomer composition for obtaining acrylic resin which has adhesiveness contain a monomer which constitutes a monomer and a refining ingredient which constitute a condensation ingredient other than an acrylic resin monomer used as the above-mentioned adhesive component. As a monomer which has this condensation ingredient, are as copolymerizable as an acrylic resin monomer used as an adhesive component, What has the operation which raises a glass transition point of a copolymer obtained is used, and, specifically, acrylic acid alkyl ester, methacrylic acid alkyl ester, vinyl acetate, a vinylidene chloride, acrylonitrile, styrene, etc. in which a carbon number has a low-grade alkyl group of 1-3 are mentioned. As a monomer used as the above-mentioned refining ingredient, It is used by what is as copolymerizable as an acrylic resin monomer used as the above-mentioned adhesive component, and has a functional group, and specifically, Carboxyl containing compounds, such as acrylic acid, methacrylic acid, maleic acid, and maleic acid monoester, Hydroxyl group-containing compound, such as 2-hydroxyethyl acrylate and 2-hydroxyethyl methacrylate, Glycidyl group content monomers, such as acid amide compounds, such as acrylamide, methacrylamide, N-tert-butylacrylamide, and N-octylacrylamide, glycidyl acrylate, and glycidyl methacrylate, etc. are mentioned.

[0084]Although a using rate of each monomer in the above-mentioned monomer composition changes with a kind of monomer used, purposes of using an acrylic resin composition obtained, etc., Usually, a monomer for which a monomer for which an acrylic resin monomer used as an adhesive component is used as 30 to 95 mass % and a condensation ingredient is used as five to 50 mass % and a refining ingredient is 0.1 to 10 mass %.

[0085]As a method of carrying out polymerization of this monomer composition, a solution polymerization method and an emulsion polymerization method can be used. As a catalyst used for these polymerization, peroxides, such as benzoyl peroxide, azobis isobutylnitril, ammonium persulfate, and potassium persulfate, are mentioned, for example. When performing polymerization of a monomer resin composition by a solution polymerization method, various organic solvents can be used as a polymerization solvent, for example, ester species, such as ethyl acetate, aromatic hydrocarbon, and ketone are mentioned. When performing polymerization of a monomer composition with an emulsion polymerization method, publicly known various things currently used for the usual emulsion polymerization can be used as an emulsifier.

[0086]And acrylic resin which has adhesiveness is obtained in the state of a polymer solution

or latex by carrying out polymerization of the monomer composition as mentioned above. To a polymer solution or latex produced by carrying out a heat ray absorptivity binder of this invention in this way. It can obtain by mixing the above-mentioned (A) ingredient and/or the above-mentioned (B) ingredient, A metal ion component containing a visible optical absorption agent which absorbs visible light of a specified wavelength, for example, cobalt ion which absorbs wavelength of 500 nm - 600 nm selectively, and other additive agents may be mixed if needed. A content ratio of the above-mentioned (A) ingredient in a heat ray absorptivity binder of this invention, and/or the above-mentioned (B) ingredient, It is more preferably adjusted in the range of one to 100 mass part 0.3 to 200 mass part 0.1 to 400 mass part to acrylic resin 100 mass part which has adhesiveness in the range which does not spoil translucency or adhesiveness of acrylic resin which has adhesiveness although the larger possible ones are desirable.

[0087]A heat ray absorptivity coating agent, a heat ray absorptivity complex, and a heat ray absorptivity binder which were explained above, It is suitable, if it is preferably applied to a translucency member etc. as which cover of a heat ray is required and applies to a member for obtaining lighting and views, such as a window material of a residence and other buildings, a window material of vehicles, such as a car and a train, and a window material of vehicles, such as an airplane and a marine vessel, as an example. A window material which applied a heat ray absorptivity coating agent, a heat ray absorptivity complex, and a heat ray absorptivity binder of this invention, Since it excels in a visible light transmittance state, having the heat ray absorptivity more than equivalent as compared with a case where a shielding member which absorbs visible light is used in order to obtain heat ray cover nature, it excels in the visibility of scenery of the exterior of a window, and is in a tendency to be easy to acquire spaciousness. A translucency light member which is thermal, and is excellent in chemical stability or a resistance to environment, and does not deteriorate easily can be obtained.

[0088]As other uses, covering material for agriculture for building a wrap greenhouse institution is mentioned in vegetable cultivation atmosphere. Although a greenhouse institution aims at internal incubation, there is a possibility that an internal temperature may rise with a heat ray from the outside more than needed in a summer. According to covering material which applied a heat ray absorptivity coating agent, a heat ray absorptivity complex, and a heat ray absorptivity binder of this invention, such a superfluous rise in heat is controlled effectively, an available term of a greenhouse institution can be extended, and it becomes possible to improve an operating ratio. Since it excels in a visible light transmittance state, the visibility of an inside from the greenhouse outside also improves. It is possible to obtain covering material which is thermal, and is excellent in chemical stability or a resistance to environment, and does not deteriorate easily.

[0089]

[Example]Although the concrete example concerning this invention is described hereafter, this invention is not limited to these.

[0090]<Example 1> Here, the raw material of monoester and diester was manufactured and various things which mix both by a predetermined ratio and from which both composition ratio differs were prepared. And the resin board of near infrared absorptivity was manufactured using those copper complexes, and the spectral characteristic was measured.

[0091](1) Manufacture of a phosphoric ester compound : having dissolved 90.1 g of 1-methoxy-2-propanol in 180 ml of toluene, and cooling at 5 ° or less, 47.4 g of diphosphorus pentoxide was added every in small quantities, and stirring was continued for the whole quantity after stirring mixing for 15 hours. Subsequently, after adding 7 ml of water after 8-hour stirring mixing at 60 °, 100 ° temperature up was carried out, and it stirred for 3 hours. It distilled off under decompression of toluene and unreacted 1-methoxy-2-propanol after ending reaction, and the ***** oil-like substance 124g of fine yellow was obtained.

[0092](2) Extraction of a monoester component : 150 g of phosphoric ester compounded above (1) was dissolved in 300 ml of water, 50 ml of dichloromethane was mixed, and a diester component and neutral components (triester etc.) were extracted to the dichloromethane layer. Only the water layer was isolated preparatively in the eggplant type flask after checking that the ingredient extracted by the dichloromethane layer has been lost, 300 ml of toluene was added to the water layer isolated preparatively, the mist separator was further added to the eggplant type flask, and azeotropy drying was carried out by heating under decompression. After drying, after separating the toluene layer, toluene in the toluene layer isolated preparatively was distilled off under decompression, and the water-white monoester component was obtained. the place which methylated the monoester component in the obtained phosphoric ester by the trimethylsilylation agent, and measured it using the gas chromatograph -- a monoester component -- 90.8-mol % -- it became clear that it contained.

[0093](3) Manufacture of a phosphonate compound : the capacitor and dropping funnel with which the agitator, the thermometer, and the water scrubber were connected with the 4 mouth flask were attached, 200 g of hexane was put in as 275 g (2.0 mol) of phosphorus trichlorides, and a solvent in this 4 mouth flask, and it heated at 50 °. Subsequently, it added, having applied 540 g (6.0 mol) of 1-methoxy-2-propanol to this solution for 2 hours, keeping the temperature of this solution at 50-70 °. The hydrogen chloride generated when 1-methoxy-2-propanol is added above was introduced into the water scrubber, and was collected. After addition of 1-methoxy-2-propanol was completed, the solvent wiping removal of the hydrogen chloride which remains was performed by attracting the inside of a 4 mouth flask at 60 ° under decompression of 500mmHg for 1 hour. And after exchanging for a distillation apparatus the capacitor attached to the 4 mouth flask, The liquid object 398g was obtained by this distillation apparatus's performing the solvent wiping removal of the 1-methoxy-2-chloropropane which is

the hexane and the reaction by-product in reaction mixture, and also carrying out distillation under reduced pressure, and collecting the fractions at 119.0-125.0 °C by 3mmHg. When gas chromatography analyzed this liquid object, the purity (what computed the surface ratio of the chart) of bis(2-methoxy-1-methylethyl)hydrogen phosphonate was 96.3%.

[0094] Manufacture of a phosphoric ester compound : In a 4 mouth flask, (4) An agitator, a thermometer, The capacitor and the dip pipe for gaseous chlorine introduction with which the sodium hydroxide solution scrubber was connected 5% are attached, In this 4 mouth flask, the obtained liquid object 226g (about 1.0 mol as bis(2-methoxy-1-methylethyl)hydrogen phosphonate) was put in, and it cooled at 10 °C. Subsequently, it continued until it blew gaseous chlorine into bis(2-methoxy-1-methylethyl)hydrogen phosphonate and the solution colored it yellow slightly, keeping the temperature at 10-20 °C. Then, by attracting the inside of a 4 mouth flask at 25 °C under decompression of 15mmHg, the solvent wiping removal of hydrogen chloride which is superfluous gaseous chlorine and a reaction by-product was performed, and the liquid object 263g was obtained. When gas chromatography analyzed this liquid object, the purity (what computed the surface ratio of the chart) of the bis(2-methoxy-1-methylethyl)phosphoro KURORI date was 92.4%. When the level of chlorine of the liquid object was measured according to "the assay of the chloride ion by a silver nitrate reference solution" indicated to the "analytical chemistry laboratory procedure" (demutualization study member issue), the level of chlorine was 14.3%.

[0095] The water 90g (5.0 mol) was added to the obtained liquid object, the temperature of this solution was raised gradually, and the bis(2-methoxy-1-methylethyl)phosphoro KURORI date was hydrolyzed on the conditions of 2 hours at 40 °C. And after exchanging for a distillation apparatus the capacitor attached to the 4 mouth flask, the resultant 234g was acquired by performing the solvent wiping removal of water from reaction mixture with this distillation apparatus. When the spectroscopic analysis by an infrared absorption spectrum was conducted about this resultant, it was checked that it is a thing containing the phosphoric ester compound (diester) expressed with the phosphoric ester compound (monoester) and the above-mentioned formula (9)-n which are expressed with the above-mentioned formula (9)-m. The infrared-absorption curve of this resultant is shown in drawing 1. A presentation and yield of the phosphoric ester compound were computed as follows about the acquired resultant.

[0096] The presentation of a phosphoric ester compound : (5) The neutralization titration of a resultant is performed using auto tight RETA COMTITE-101 by Hiranuma Sangyo Co., Ltd., The content ratio of the phosphoric ester compound (diester) expressed with the phosphoric ester compound (monoester) and the above-mentioned formula (9)-n which are expressed with the above-mentioned formula (9)-m from the obtained titration value of the 1st point of inflection and the 2nd point of inflection was computed. As a result, the ratio of monoester and diester was 3.8 % of the weight : 91.6 % of the weight.

[0097]Yield : (6) Add concentrated nitric acid and perchloric acid to the resultant acquired above (5), and it decomposes thermally to it, After adding and diluting distilled water, nitric acid, 0.25% ammonium vanadate solution, and 5% ammonium molybdate solution are made to add and color in this solution, When the absorbance with a wavelength of 440 nm was measured using the spectrophotometer and it asked for the phosphorus concentration in a resultant on the basis of the absorbance of the Lynn standard solution, it was 13.0 % of the weight. It was 86.4% as a result of computing yield from this phosphorus concentration and the phosphorus concentration (% of the weight) in the used phosphorus compounds.

[0098](7) Preparation of a phosphoric ester compound which has predetermined monoester / diester component ratio : various phosphoric ester which has a predetermined monoester ratio was prepared by carrying out weighing mixing of the monoester component extracted above (2) and the diester component manufactured by the above (5). About each preparation, it titrated using the potassium hydroxide solution, the equivalent of phosphoric ester was calculated, and the equivalent of copper salt required for composition of a copper complex was computed based on the equivalent.

[0099](8) Manufacture of a phosphoric ester copper complex : the equivalent of copper acetate 1 hydrate is respectively mixed to various phosphoric ester compounds which have a different monoester component ratio prepared above (7), toluene was added there and drying flowing back was carried out. Under decompression, drying and deacetalation were performed, and also toluene was distilled off, and the blue-green powder of each phosphoric ester copper complex was obtained.

[0100](9) Manufacture of a resin board : dissolution mixing of the various phosphoric ester copper complexes 5g which have different monoester / diester component ratio prepared above (8) was carried out at 94.8 g of methyl methacrylate, and 0.2 g of alpha-methylstyrene, and the blue mixed solution was obtained. To these mixed solutions, 1 g of par butyloxy neodecanate was respectively added as a polymerization initiator, and mixed stirring was improved. The circumference of the monotonous glass of two sheets by which the placed opposite was carried out mutually in parallel filled up the glass cell which a seal is carried out and changes with the adhesive tape of a polyester base with the filtrate filtered using the membrane filter which has 3 micrometers in an aperture. And it was put into oven and it was made to polymerize from incubation and 40 ° to 65 ° at 40 ° in 2 hours for 8 hours by the temperature profile who called it incubation at temperature up and 100 ° to temperature up and also 100 ° for 1 hour, and called it cooling to 60 ° in 1 hour in 1 hour. It released from mold from the glass plate after the polymerization, and the 3-mm-thick transparent blue resin board was obtained. Thus, about two or more resin boards which have obtained different monoester / diester component ratio, spectral transmittance was measured using U-Hitachi, Ltd. make 4000 spectrophotometer.

[0101] Drawing 2 is a graph which makes peak wavelength wavelength from which transmissivity serves as the minimal value, and shows change of the peak wavelength to a monoester ratio (mol %) in the range of 700-850-nm wavelength. From drawing 2, when the ingredient ratio of monoester became more than 63 mol %, it became clear that it was in the tendency which becomes constant [peak wavelength] at abbreviated 840nm. Drawing 3 is a graph which shows change of the transmissivity in the wavelength of 1000 nm to a monoester ratio (mol %). From drawing 3, if the composition ratio of monoester becomes more than 63 mol %, it will be understood that it is in the tendency for the transmissivity in the wavelength of 1000 nm to be less than 5%.

[0102]<The comparative example 1> Manufacture of (1) phosphoric-ester copper complex: 40.5 g of phosphoric ester and the copper acetate 1 hydrate 32.1g containing monoester 62 mol % are mixed, 270 ml of toluene was added there and drying flowing back was carried out. Drying and deacetation were performed under decompression, and also toluene was distilled off, and the blue-green powder 47.1g of the phosphoric ester copper complex which is an object was obtained.

(2) Manufacture of a near infrared absorptivity resin board : dissolution mixing of the copper complex 5g manufactured in the above (1) in the solution which mixed 94.8 g of methyl methacrylate and 0.2 g of alpha-methylstyrene was carried out, and the blue mixed solution was obtained. To this mixed solution, 1 g of par butyloxy neodecanate was added as a polymerization initiator, and mixed stirring was improved. The same glass cell as having used in above-mentioned Example 1 was filled up with the filtrate filtered using the membrane filter which has 3 micrometers in an aperture, and it was polymerized in the above-mentioned Example 1 and the temperature profile. It released from mold from the glass plate after the polymerization, and the 3-mm-thick transparent blue resin board was obtained. The result of having measured spectral transmittance about the obtained resin board using U-Hitachi, Ltd. make 4000 spectrophotometer is shown in drawing 4.

[0103]<Example 2> 90.1 mg (1 mol) of 1-methoxy-2-propanol was dissolved in 180 ml of toluene, and below 5 **, 47.4 g (1/3 mol) of diphosphorus pentaoxide was added every in small quantities, and was stirred all night. Subsequently, after 8-hour stirring and 7 ml of water were added at 60 **, and it stirred at 100 ** for 3 hours. It distilled off under decompression of a solvent etc. and the phosphoric ester compound 124g of the shape of ***** oil of fine yellow was obtained. And after having put the 120 g of this phosphoric ester, and copper acetate 1 hydrate 100g into 200 ml of toluene, mixing in it and making it dissolve in it, drying flowing back was carried out for 6 hours. The solvent was distilled off after deacetation and drying and m in said formula (5) or said formula (6) obtained the solid powder 141.3g of the copper rust color as a phosphoric ester copper compound which has the basis R which is 1.

[0104]<Example 3> 150 g (1 mol) of dipropylene glycol monomethyl ether (made in Tokyo

Chemicals) was dissolved in 200 ml of dimethoxyethane, and at 5-10 **, 47.4 g (1/3 mol) of diphosphorus pentoxide was added every in small quantities, and was stirred all night. Subsequently, after adding after 2-hour stirring and 15 ml of water at 60 ** and stirring at 80 ** for 2 hours, it distilled off under decompression of a solvent etc. and the phosphoric ester compound 205g of the shape of ***** oil of fine yellow was obtained. And after having put the 50 g of this phosphoric ester, and copper acetate 1 hydrate 26g into 150 ml of toluene, mixing in it and making it dissolve in it, drying flowing back was carried out for 6 hours. The solvent was distilled off after deacetalation and drying and m in said formula (5) or said formula (6) obtained 47.6 g of ***** oil of the copper rust color as a phosphoric ester copper compound which has the basis R which is 2.

[0105]<Comparative study 1> The following measuring devices and measuring conditions measured and compared the pyrolysis character of the phosphoric ester copper compound obtained in above-mentioned Examples 2 and 3.

a) measuring device: -- Mettler TA4000 thermometric-analysis system b measuring condition and heating-rate: -- a part for 10 **/- temperature requirement: -- 30-300 ** and atmosphere : a nitrogen atmosphere and test portion weight: -- m=1 (example 2) 9.878mg:m=2 (example 3) 17.206mg drawing 5, The pyrolysis chart of the phosphoric ester copper compound which has the basis R whose m concerning Example 2 is 1, and drawing 6 are the pyrolysis charts of the phosphoric ester copper compound which has the basis R whose m concerning Example 3 is 2. As shown in drawing 5 and drawing 6, the pyrolysis temperature of the phosphoric ester copper compound which has the basis R whose m is 2 to the pyrolysis temperature of the phosphoric ester copper compound which has the basis R whose m is 1 being 220.7 ** is 193.2 **. In the figure, the value which rounded off below the decimal point of decomposition temperature was shown. Thus, it had decomposed at the temperature in which the phosphoric ester copper compound which has the basis R whose m is 1 is more expensive than the phosphoric ester copper compound which has the basis R whose m is 2 27.5 **, and the thermally stable thing became clear. It is only that the kinds of alcohol of a starting material [in / in both compounds / manufacture] differ, and both are manufactured on the same stoichiometry conditions that 1/3 mol of diphosphorus pentaoxides react to 1 mol of both alcohol. Therefore, the difference in the above-mentioned thermal stability may be presumed to be what is based on a difference of the kind of raw material alcohol.

[0106]<Example 4> Add to methyl methacrylate independently, make it dissolve thoroughly, and to these the phosphoric ester copper compound manufactured in the above-mentioned Example 2 and above-mentioned Example 3 Alpha-methylstyrene, Polymerization initiator t-butyl peroxy neodecanate was added, it poured into the mold which comprises two glass substrates arranged at intervals of 3 mm in width, and polymerizing and solidifying were carried out independently. The transparent blue plate which releases from mold after a

polymerization and has near infrared absorptivity was obtained. These plates are set under the temperature of 60 **, and the high-humidity/temperature environment of 90% of humidity RH, The plate obtained from the phosphoric ester compound in which m manufactured in above-mentioned Example 2 has the basis R which is 1 as a result of measuring the spectral transmittance curve after 0 hour, 500 hours, and 1000-hour progress, Also after 1000 hours passed, there was no change of the transmissivity in a visible region, and observation by viewing did not have change of a color, either. On the other hand, it became clear that the transmissivity in a visible region fell temporally as the plate obtained from the phosphoric ester compound which has the basis R whose m manufactured in above-mentioned Example 3 is 2 passed for 0 hour - 1000 hours. When the plate was observed by viewing, signs that the color grew yellow temporally were accepted. From this result, it was checked that m excels [copper compound / which has the basis R whose m is 1 / phosphoric ester] the phosphoric ester compound which has the basis R which is 2 in the resistance to environment.

[0107]

[Effect of the Invention]According to the near infrared absorptivity constituent and display front plate of this invention, as explained above. The phosphate group of a phosphoric ester compound combines with a copper ion by the coordinate bond and/or an ionic bond, and after having been surrounded by phosphoric ester, this copper ion, Into a constituent, dissolve or distribute and selective absorption of the near infrared is carried out by the electron transition between d orbits of this copper ion, And the rates of a monoester phosphate compound ingredient and a diester phosphate compound ingredient are 63:37-99:1 in a mole ratio, and the wavelength of the near infrared with which an absorptivity becomes high most (transmissivity becomes small most) serves as near 840 nm, and. It becomes possible to improve near infrared absorption performance as the transmissivity in the wavelength of 1000 nm is less than 5%.

[Translation done.]